

# Shadow Banks and the Financial Crisis of 2007-2008

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## Introduction

2005 was the first year without bank failures in the US since reliable records began to be kept in 1892 (Figure 1; source: FDIC Table BF02 and Goldenweiser et al., 1932).

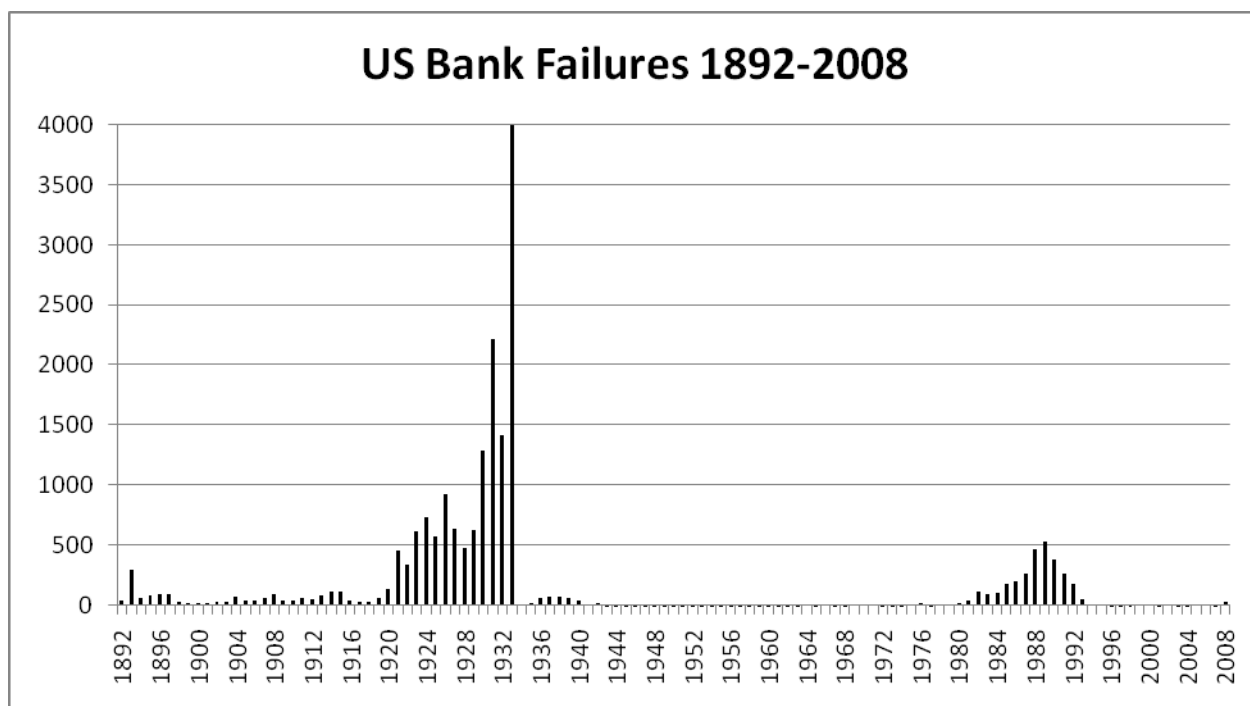


Figure 1

The prospects looked good too, with the major indicators above historical averages, and well in excess of the requirements for well-capitalized banks (Table 1; source: FDIC).

**Table 1**

	2006	2005	2004	2003	2002	2001	2000	Well-Capitalized
Core capital (leverage) ratio	8.23%	8.25%	8.11%	7.88%	7.86%	7.79%	7.71%	5%
Tier 1 risk-based capital ratio	10.52%	10.66%	10.76%	10.47%	10.43%	9.90%	9.42%	6%
Total risk-based capital ratio	12.99%	12.98%	13.19%	13.00%	13.00%	12.72%	12.13%	10%
Net charge-offs to loans	0.38%	0.50%	0.56%	0.78%	0.97%	0.83%	0.59%	N/A

As late as the fall of 2006, the regulators in their quarterly report focused on the strong earnings and revenues, the fast asset growth, the robust capital indicators, and the all-time low achieved by the noncurrent loan rate (FDIC, 2006). Industry analysts concurred. “The U.S. banking industry is entering 2006 in a relatively healthy condition,” noted the rating firm A.M. Best in its annual review (A.M.Best, 2006). And indeed, no banks failed in 2006 either, for the second time ever.

But just outside the solid fortress of the heavily regulated banking industry was hiding a beast labeled by Paul McCulley of Pimco the “shadow banking system” (McCulley, 2007). It attracted little attention from either the regulators or the media, until suddenly it emerged as one of the main reasons for “the worst financial crisis since Depression” (IMF, 2008).

A financial crisis occurs when multiple financial intermediaries fail simultaneously, thus disrupting the operation of a certain financial market. Barring an unlikely coincidence, this requires one or both of the following conditions:

- (1) a detrimental *external factor* affects many institutions at once
- (2) a problem in one institution spreads to others through an internal *contagion mechanism*

Viewing this from the perspective of individual institutions, each of them can fail due to:

- (a) investment risk (losses from directional bets),
- (b) hedging risk (large variance between a position and the risk it is supposed to offset),
- (c) counterparty risk (default of trading partners), or
- (d) liquidity risk (inability to sell assets at fair value due to time constraints).

In this article we investigate the role that the shadow banking system played in the present crisis.

## **Bank Runs**

The past two years have seen reemergence of bank runs, once a recurrent phenomenon causing enormous welfare destruction, but by now largely eliminated through various policy measures such as deposit insurance. In this section, we describe the theory behind bank runs.

A bank run is a fast loss of deposits or other short-term financing by a financial institution, which causes it to fail from the lack of liquidity.

While a traditional bank run has depositors queuing outside a retail bank branch, the concept of a bank run applies to many other situations. For example, mutual fund investors may decide to redeem their shares all at once; a hedge fund may find no lenders willing to roll over its repos; a conduit may find itself unable to sell short-term commercial paper to refinance the expiring obligations; and so on.

In their seminal paper, Diamond and Dybvig (1983) explain why banks typically have liquidity mismatch in their balance sheets, and how this mismatch enables bank runs. The Diamond-Dybvig model assumes that risk-averse consumers look for investment opportunities but do not know in advance when they will need their money back. The investment projects of the

production sector are illiquid in the sense that selling them early (before they mature) can only be done at a penalty. The role of banks is to satisfy investor demand for liquidity by converting illiquid assets (loans to the production sector) into liquid liabilities (demand deposits). In this model, all banks are mutual banks (i.e., have no equity), and create liquidity just by pooling risks among its depositor-owners.

The main finding of the paper is that this setup allows multiple equilibria. In the “good” equilibrium, only the depositors experiencing idiosyncratic need for liquidity withdraw their money early. The bank sells *some* of its illiquid assets at a penalty to generate the cash for those withdrawals. However, due to risk pooling that penalty is partially borne by depositors who withdraw at maturity. As a result, individual investor payoff in the two scenarios (“need liquidity” and “don’t need liquidity”) is smoothed out. This creates value because investors are risk-averse.

In the “bad” equilibrium, a bank run occurs. All depositors, regardless of their liquidity needs, withdraw their money early fearing bank failure. The bank is forced to sell *all* its assets at a penalty. Risk pooling does not work, since no one waits until maturity. The bank cannot meet its contractually promised payoffs and has to declare bankruptcy.

In the bank run equilibrium, investors redeem early because they suspect (rightly or wrongly) that others might want to do the same, and (correctly) concluding that this would cause the bank to default. In the case of impending default, it is better to redeem early, while the bank is still attempting to meet its obligations. The fear of a bank run thus becomes a self-fulfilling prophecy.

Thus, in Diamond-Dybvig model, a bank run occurs when a number of investors come to believe that many other investors are going to withdraw their funds (or, equivalently, deny refinancing).

For example, suppose an (unbiased) rumor spreads on Wall Street that a certain bank finds it hard to obtain overnight loans. A bank that suddenly cannot roll over its overnight liabilities is likely to run out liquidity and default. There is an incentive to abandon the suspect bank as early as possible as the default would hurt those who provided the very last loans. Therefore, the rumor can scare all potential lenders away, and the bank can fail from a run by its counterparties in a self-fulfilling prophecy.

The strength of the Diamond-Dybvig model is that it can explain such sporadic runs, in which depositors or counterparties leave mostly out of fear to be the last ones on the sinking ship, and would have stayed if they knew others were staying.<sup>1</sup>

On the other hand, in case of a real economic problem (or a rumor thereof), investors do not care whether others are staying or leaving: no one is willing to keep their funds tied up in a failing institution regardless of what other investors are doing. In such scenario, the Diamond-Dybvig mechanism should not be considered the primary cause of failure although it can certainly speed up the demise (a failing institution meets its end even faster when it loses liquidity).

To distinguish the two scenarios, we will refer to the former as a *Diamond-Dybvig bank run*, and to the latter as an *fundamentals bank run*.

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<sup>1</sup> The extreme case is that of a *sunspot run*, where no economic factor is present whatsoever. Sunspot refers to any random variable that has no independent economic significance and yet influences the choice of the equilibrium. The term originated from an obscure economic research by Jevons (1875) that attempted to predict corn prices using sunspot activity.

Empirical research on sunspot runs is controversial. Some authors (Gorton, 1988; Allen & Gale, 1998) argue that bank panics are caused by actual economic problems. Others (Ennis, 2003) claim that sunspot theory is a likely explanation for many bank panics.

It remains beyond doubt that a very minor economic issue (e.g., one with no perceivable impact on default probability) can cause a bank run through the sunspot mechanism. The news itself can serve as the coordination device that selects the “bad” equilibrium.

Bank panic is a simultaneous run on many banks. It can consist of many independent bank runs, caused by an external economic problem such as a spike in bad loans. More often, however, it is fueled by the contagion mechanism: a default of a few banks causes direct losses at counterparties, lowers prices on assets held by other banks due to fire-sale liquidations, and reduces the amount of liquidity in the system (since creditors usually don't know exactly which particular banks are in trouble and reduce overall lending).

Measures against bank runs include:

- deposit insurance
- lender of last resort facility
- suspension of convertibility
- maintaining sufficient liquidity

The first two measures are under the control of an external authority (e.g., the government needs to provide the funds and can set requirements for the deposit insurance program). The last two are largely under the control of individual institutions.

Today, most countries address the problem of bank runs by providing government guarantees for deposits (at least up to a certain amount). According to the International Association of Deposit Insurers, deposits are currently guaranteed by the governments of nearly 100 countries, including 28 of the 30 OECD member states (the only exceptions being Australia and New Zealand). Once depositors do not bear the risk of a loss, they lose the incentive to withdraw at the first sign of trouble. This is by far the most effective way to avoid bank runs. However, deposit insurance

cannot be extended beyond the (nearly risk-free) bank deposits<sup>2</sup>. Insuring a risky asset is economically infeasible because it destroys its *raison d'être*: to transfer risk to those investors who are willing to bear it in return for a higher return.

The lender of last resort can provide a loan to a financial institution when the market refuses to do so, possibly avoiding default caused by the lack of liquidity. In the United States this function is performed by the Federal Reserve. Until recently, it was limited to commercial banks, and rarely used (for fear of a stigma associated with the need for emergency funds). During the recent crisis, however, the Fed greatly expanded this function both through individual loans (such as the \$85B initial loan to AIG) and by introduction of new programs (such as Term Auction Facility).

Until early 20<sup>th</sup> century, US banks often suspended depositors' withdrawal rights without going through bankruptcy. This provided extra time to liquidate assets in a more orderly manner, and thus avoid a fire-sale liquidation that might cause insolvency. This approach is still used today by hedge funds, mutual funds and others who have implied but not legally binding obligation to redeem their own shares on demand. It does not work for any debt obligations, so if buyers cannot be found for new commercial paper, the option to simply delay the payment on the expiring paper does not exist (except through a bankruptcy).

Finally, holding sufficient liquid assets reduces the chance that investors would become concerned about liquidity to begin with. Each institution makes its own decision about what amount of liquidity is sufficient. In the United States, there are regulatory requirements for banks

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<sup>2</sup> As we discuss below, the US government did offer temporary insurance for money market fund investments in 2008. However, money market fund shares are the safest securities other than bank deposits. Furthermore, the insurance only covered existing investments as of the announcement date, and not a single dollar of new investments after that. This prevented the otherwise inevitable moral hazard effect.

to hold sufficient reserves but those requirements have not been binding for at least a decade (Bennett & Peristiani, 2002).

All the measures listed above are very effective against a Diamond-Dybvig run (whether on an individual bank or on the whole industry). However, no amount of liquidity (whether injected by the Fed, obtained by delaying payments on liabilities, or from internal reserves) can stop investors running away from a failing institution. This leaves deposit insurance as the only solution for fundamentals bank runs. Due to the limitations discussed above, it is generally feasible only for actual bank deposits. Thus, fundamentals bank runs will happen unless all financial institutions have such a conservative risk profile that they are never in trouble – an unrealistic constraint on the modern financial industry.

## **Shadow Banks**

Rephrasing McCulley, *shadow banks* are entities that fund illiquid assets with short-term liabilities and yet remain outside of the banking regulation. The liquidity mismatch makes shadow banks prone to bank runs, while the traditional safeguards embedded in the bank regulation are missing. However, as we argue below, most of the bank runs experienced by shadow banks were of the fundamentals rather than the Diamond-Dybvig variety, and as such would not have been prevented by any existing regulation.

Shadow banks include broker-dealers, hedge funds, private equity groups, structured investment vehicles (SIVs), conduits, CDO structures, money market funds, non-bank mortgage lenders, and other similar entities.

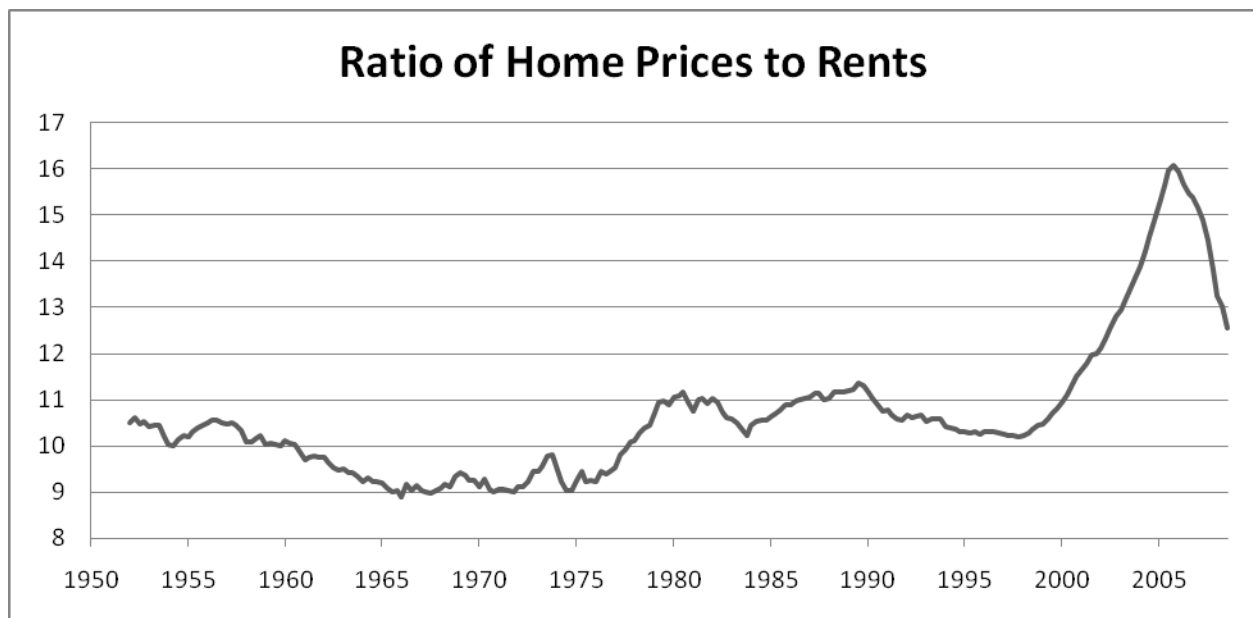
Note that the liquidity mismatch does not necessarily mean that the assets have longer term than liabilities. The litmus test is the following. Assume that none of the liabilities can be rolled over, and hence the assets have to be sold off to meet the obligations. Such scenario is likely to result in a fire-sale price discount borne by the holder. The higher this price penalty, the larger the liability mismatch.

Demand deposits and investments in mutual funds have an effective maturity of a single business day, since redemptions can be made without notice. If an asset-backed commercial paper (ABCP) money-market mutual fund had to sell its assets within one day, the fire-sale price penalty would be devastating if it happened when the ABCP market was strained by subprime mortgage fears. On the other hand, a fixed-income mutual fund investing in long-term Treasury bonds could dispose of its assets in one day with almost no price penalty. Therefore, the liquidity mismatch is quite high in an ABCP money market fund, but virtually non-existent in the Treasury bond fund despite the latter's much longer asset duration.

## **Economic Preconditions for the Crisis**

The root of the financial crisis was in the home price bubble that began somewhere around 2000. Following (Cecchetti, 2008), we look at the ratio of home prices to rents for the residential real estate (Figure 2; source: Federal Reserve Board table B.100 line 4 and Bureau of Economic Statistics table 2.3.5 line 14). It is similar in concept to the equity P/E ratio, and as such should be driven by the expected growth rate of rents and the expected return required from the investment in one's own house. Despite various complicating factors in the housing market

economics<sup>3</sup>, this ratio stayed in the 9 to 11 range for half a century, before skyrocketing from 11 to 16 at an accelerating pace during 2000-2005. At the same time, the inflation-adjusted rent was growing at a relatively steady rate (averaging 0.5% per year, and never exceeding 2.1% per year) since the data became available in 1983 (Figure 3; source: BLS – owners' equivalent rent of primary residence and seasonally adjusted CPI excluding energy and food). There was no obvious reason for the expected rent growth to spike so high above the historical level; in fact rent growth had been slowing down since 2003. As a result, it would be reasonable to conclude that home prices to rent ratio would have to revert back to its historical levels, which as of late 2005 required a 30-35% fall in the home prices. However, some researchers suggest that it was not obvious at the time that home prices were due for a significant fall (Gerardi, Lehnert, Sherlund, & Willen, 2008). Whether or not the housing market meltdown was expected, it certainly became the origin of the crisis.



<sup>3</sup> For instance, the required return on one's own house is lower than on other investments with a similar risk profile due to the substantial nonmonetary utility derived from living in one's own house. This fact should increase the home price / rent ratio beyond a similar ratio for rental properties. Furthermore, an increase in the desire of consumers to own a home, or in their wealth (hence their ability to afford such nonmonetary utility), should increase this ratio.

Figure 2

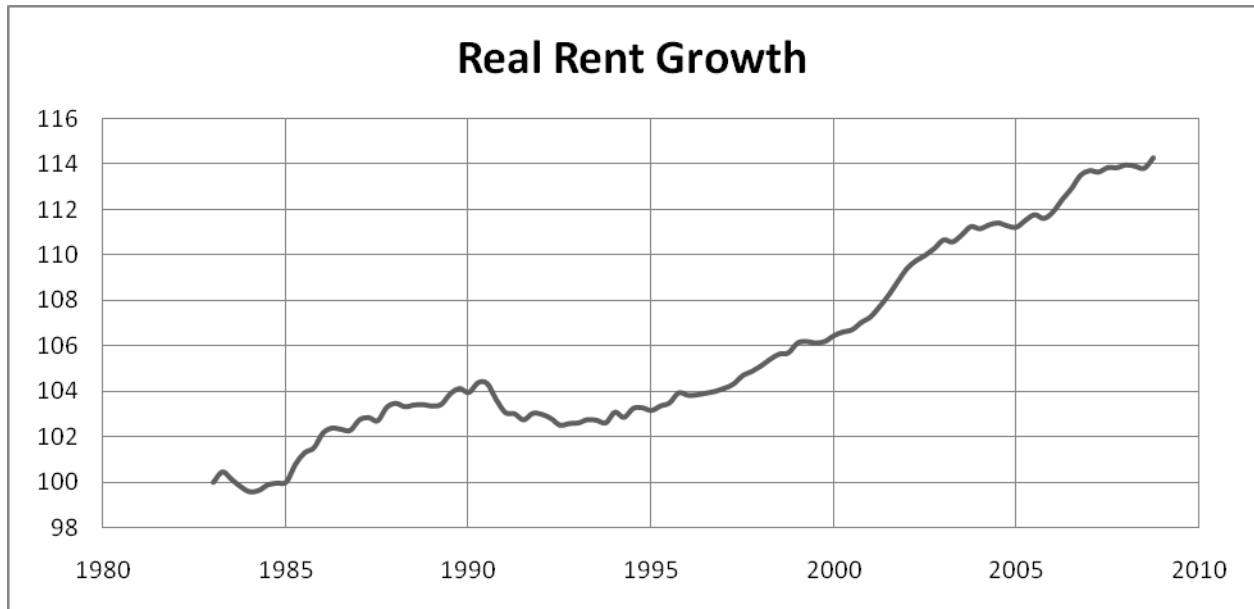


Figure 3

The first signs of the slowdown could be seen in 2005 (Figure 3; source: S&P/Case-Shiller seasonally adjusted U.S. national home price index). In Q2 2006, home prices fell for the first time in 14 years.

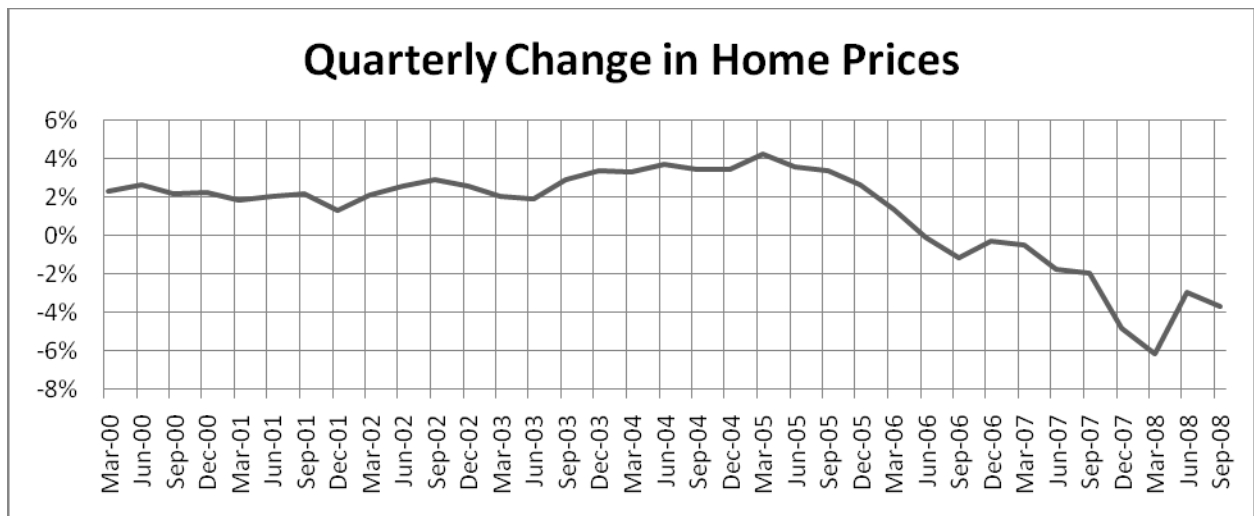


Figure 4

Many subprime borrowers could only afford mortgage payments by continuously refinancing the property at fast-growing valuations. As a result, the past-due (30-89 day) mortgage loan rate jumped by 0.13 percentage points in Q3 2006. It took another quarter for this to translate into noncurrent (over 90 days) mortgage loan rate and the charge-off rate (Figure 4; source: FDIC Quarterly Banking Profile; we removed the data point for Q4 2005 due to the impact of a one-time accounting rule change).

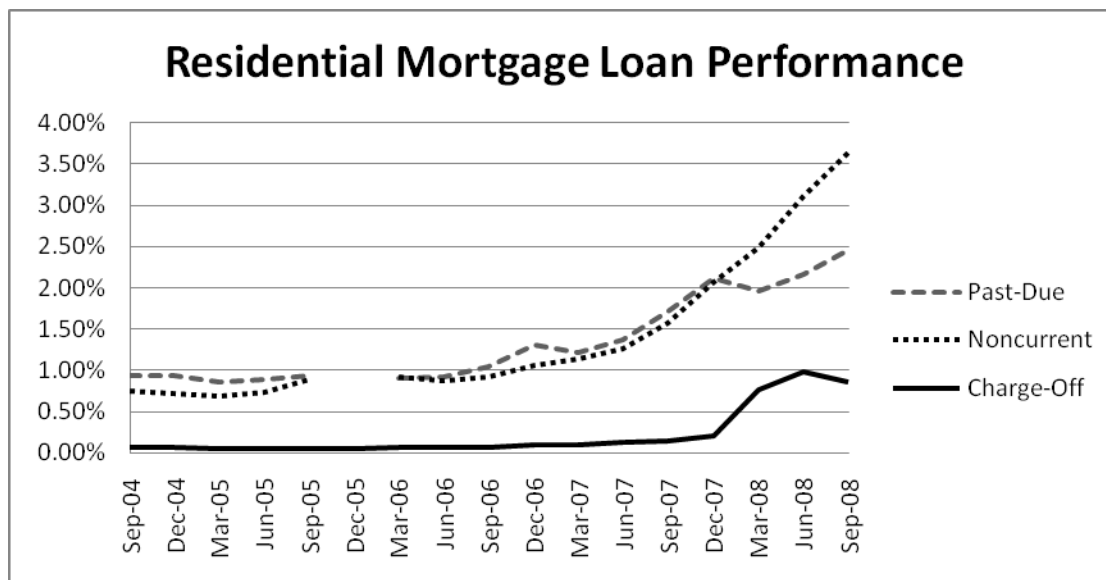


Figure 5

## Crisis Timeline

On February 8, 2007 HSBC surprised analysts by announcing a much larger than expected loan-loss provision for 2006, blaming deteriorating US mortgage business. This was the beginning of a constant stream of reports of major losses and bankruptcies among subprime lenders, homebuilders, and other institutions exposed to those markets. At this point, the problem was not limited to simple investment losses for institutions involved. First, the trading in securities tied to the subprime market became very slow, which caused severe liquidity problems for the holders

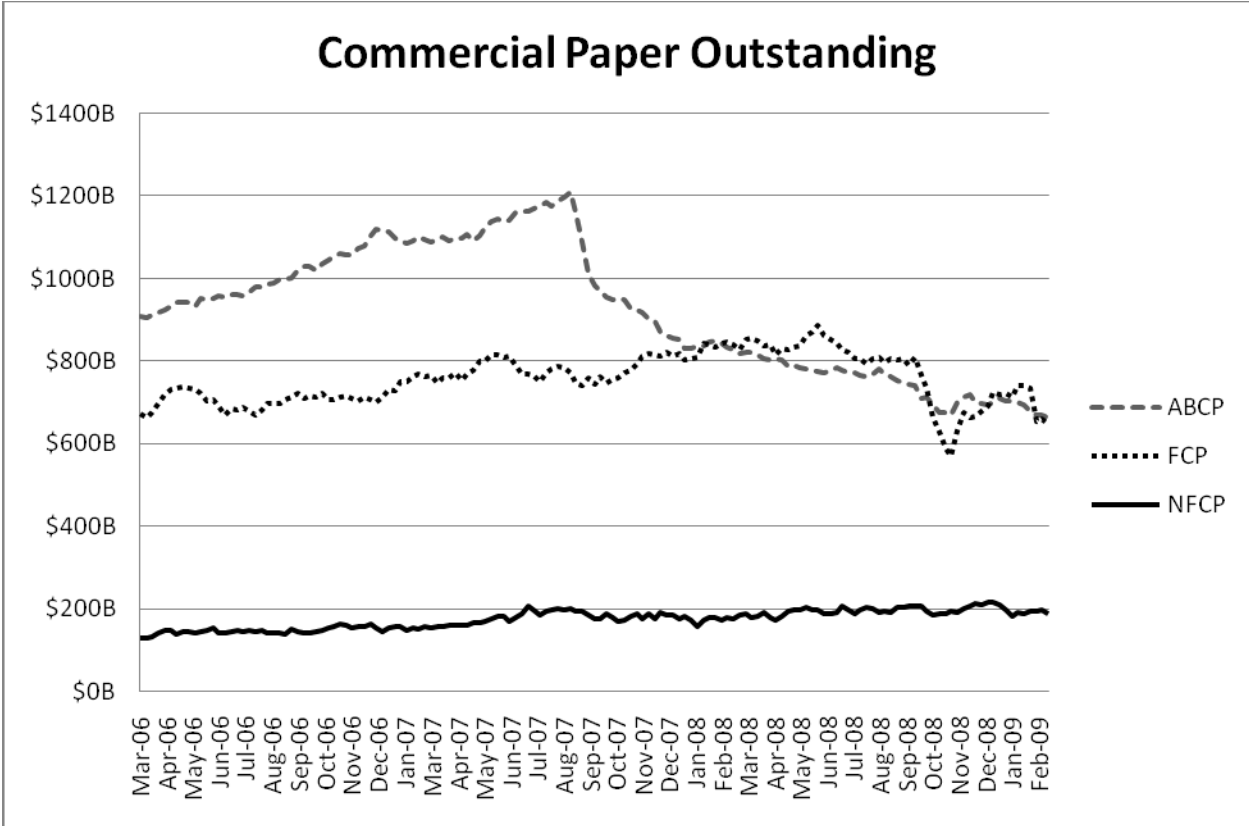
of those assets. Second, the lack of transparency meant that the market punished some institutions that had no subprime exposure whatsoever.

In March 2007, a Bear Stearns hedge fund, High-Grade Structured Credit Strategies (HGSCS), experienced its first down month since its inception in 2003, a quite modest 3.7%. As of March 31, the fund had \$925m in capital and was \$9.7B long and \$4B short in various subprime mortgage market securities. Upon learning of the loss in late April, investors, scared by unexpected losses, redeemed \$100m. The requisite asset sales from this tiny redemption were probably in the range of \$1B due to leverage. This was enough to move the illiquid market in the mortgage-backed CDOs causing further damage to the fund's valuation.

In mid-April, Bear's counterparty Goldman Sachs revalued the subprime securities it was involved in trading with Bear. The marks went from 98 cents on the dollar to 50-60 effectively destroying the HGSCS and its sister fund, High-Grade Structured Credit Strategies Enhanced Leverage (Cohan, 2009). By early June redemptions were frozen, but lenders increased margin requirements and marked down the collateral. Despite calls from Bear for a negotiated orderly liquidation, one of the lenders, Merrill Lynch, offered for sale about \$400m of the seized collateral, but found bids only at significant discounts. Any additional sales would further depress the prices, and force more margin calls and more sales (not just from this fund, but from any other investors who carried exposure to subprime mortgages). This loss spiral, described in detail by Brunnermeier (Brunnermeier, 2008), threatened to cause more defaults among highly leveraged investors in subprime assets as well as among institutions exposed to them. The latter would include Bear Stearns, the largest prime broker to hedge funds.

Finally, in late June, Bear Stearns offered to bail out the less leveraged HGSCS with a \$3.2B facility into which the fund's repo loans were rolled. The other fund would be liquidated by the lenders. The partial rescue did little to stop the contagion effect; the securities valuations continued to plummet, and trading in any subprime-related securities was virtually non-existent. The initial losses in the two hedge funds were regular (and quite modest) investment losses. The subsequent run by investors was prevented by a freeze on redemptions. The damage was done by the loss spiral fueled by the lack of liquidity in the markets and by the high leverage of the funds.

On August 9, 2007, BNP Paribas froze redemptions in three of its investment funds citing its inability to value the assets due to a total lack of trading activity in the asset-backed securities market. BNP Paribas reopened the funds less than three weeks later, with virtually no change in the NAV. In other words, the funds were solvent and liquid; the problem was purely the failure of the market price discovery mechanism. However, BNP Paribas' announcement triggered a panic in global financial markets, freezing interbank lending and short-term funding markets (see Figure 6 which compares the total outstanding amounts of asset-backed commercial paper and commercial paper issued by financial and non-financial companies; source: Federal Reserve Board Statistical Releases).



**Figure 6**

The first major victim was Northern Rock, a UK retail bank that used brokered deposits to finance a significant part of its balance sheet. The lack of demand for commercial paper meant that it could not refinance its maturing obligations. The bank reported liquidity problems to the UK regulators on August 13, 2007, and for a month the Bank of England attempted in vain to find a solution (such as a takeover). Finally, on September 14, 2007, the Bank of England announced emergency measures to support the bank, triggering the widely-publicized run on the bank. By then, Northern Rock had already been doomed by the bank run at the institutional level; the retail bank run was an afterthought rather than the cause of the crisis (Shin, 2009). The only difference between Northern Rock and other UK retail banks was the unusually high reliance on the wholesale capital market and hence the lack of deposit insurance on that part of its liabilities (brokered deposits were not insured). The run on Northern Rock was part of an overall

fundamentals run on the capital markets, driven by a combination of a subprime mortgage meltdown and the lack of information about exposures and valuations in that market.

The next wave of victims consisted of issuers of asset-backed commercial paper that could not find buyers when they tried to roll it over. Cheyne Finance and Rhinebridge were among those that succumbed to the run on the commercial paper in October 2007.

By March 2008 Bear Stearns, the most leveraged of the investment banks, had already been weakened by exposure to agency bonds, subprime mortgages and the failed mortgage fund, Carlyle Capital. By March 11, its liquidity pool started to deteriorate. On March 11, a rumor was started that Goldman Sachs was unwilling to face Bear Stearns as counterparty<sup>4</sup>. The rumor caused a run on Bear Stearns by hedge fund clients and repo counterparties. By Sunday, the bank was bailed out in a takeover by JP Morgan with a \$29B loan from the Federal Reserve.

According to the SEC, Bear Stearns' liquidity pool fell from the perfectly adequate \$18.1B on March 10 to \$11.5B on March 11 and to \$2B on March 13. However, throughout the week, Bear Stearns remained firmly in compliance with the net capital requirements for its broker-dealers and the capital ratio standards for its holding company (Cox, 2008). The SEC blamed the demise of the bank on the "crisis of confidence," which was just another name for a bank run. This was one of the rare examples where a Diamond-Dybvig bank run destroyed a major institution in the current crisis.

On July 11, 2008, IndyMac was seized by FDIC in one of the biggest bank failures in the US history. The bank struggled due to a large amount of mortgage loans that it was unable to

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<sup>4</sup> According to Goldman Sachs, late in the day on March 11, Hayman Capital requested a trade whereby Goldman would insure Bear Stearns' obligations in a derivatives trade. Goldman Sachs replied that they would consider it. Hayman Capital misinterpreted this as refusal. Even though the next morning Goldman Sachs actually accepted the trade, and continued trading with Bear Stearns for the rest of the week, the damage to Bear Stearns was irreversible.

securitize and instead kept on its books. On May 12, the bank reported in its 10-Q filing that it barely met the “well-capitalized” regulatory guidelines; indeed, accounting for the April downgrades on the mortgage-backed securities it was holding, it was already below the threshold. A controversial public letter by Senator Schumer on June 26 warned of the bank’s imminent demise, and caused a small run on IndyMac (quite irrational since most depositors were fully FDIC-insured); the loss of \$1.3B in deposits over the 11-day period became the final straw. The main cause of failure was a simple investment loss and not a bank run.

On September 7, 2008, Fannie Mae and Freddie Mac were taken over by the federal government for fear that their falling capitalization and inability to raise new funds might cause further disruption to the US housing market. These agencies were badly mismanaged and had a history of accounting problems. The crisis only made their problems more visible.

On September 15, 2008 Lehman Brothers announced bankruptcy after huge losses from subprime mortgage-related securities on its books. Lehman was not taken down by a liquidity crisis or a bank run: unlike Bear Stearns half a year earlier, Lehman had access to the Fed’s discount window, and major counterparties including Goldman Sachs, Merrill Lynch and Citigroup continued doing business with it until the end. Lehman Brothers failure was a result of slow erosion of capital in a stream of write-downs. This time the Fed did not come to the rescue, and the shareholders were wiped out, while the bondholders recovered less than 10 cents on the dollar.

The next day, September 16, 2008, one of the largest insurers of mortgage-backed securities, AIG had to be rescued by the Fed’s credit line of \$85B (expanded by March 2009 to \$163B). The crisis at AIG came about after the company’s debt rating was downgraded on September 15.

The rating agencies cited mounting losses and extremely limited ability to raise cash due to falling stock price and widening yields on debt, as well as difficult capital market conditions. The downgrade allowed AIG's credit default swap counterparties to demand up to \$14.5B of additional collateral, which AIG did not have. Without the rescue package, AIG would have likely defaulted within 24 hours; it had already hired the law firm to draw up bankruptcy papers. There was no run on AIG; on the contrary, several of its US counterparties made an effort to prevent AIG's collapse, fearing market panic far worse than that caused by Lehman's collapse. AIG's near-failure was caused by the lack of liquidity which prevented it from deleveraging as required by the market conditions. The contagion effect was avoided by the costly rescue by the U.S. government based on "too large to fail" concept.

Also on September 16, The Reserve Primary Fund, the nation's oldest money market fund, announced that its NAV fell to \$0.97. The fund, which had \$62B in assets as of the morning September 15, became the second in the industry's 37-year history to "break the buck". The cause was the \$785m face amount of Lehman Brothers commercial paper and medium-term note securities in the fund's portfolio. These securities were revalued from par to \$0.80 per dollar on the morning of September 15, but the NAV remained at \$1.00. Nearly \$39B of redemption requests were submitted at \$1.00 per share by investors who learned about the fund's exposure to Lehman debt (this information was publicly available). At 3 pm on September 16, Lehman debt was revalued to zero. By then, the fund shrank to \$23B, and the revaluation pushed the NAV to \$0.97. Note that the \$0.03 difference in price received before and after 3 pm on September 16 was caused not by the run on the fund but by the fall in the valuation of the Lehman debt.

Of course, redemptions kept coming (all but \$3B in assets had been redeemed by the end of the week). Given the extreme illiquidity of the market at that time, the run could have caused

enormous losses to investors. The Primary Fund dealt with this problem quite simply: it did not sell any of its assets. The first \$10.8B in redemptions was paid out on September 15 with an overdraft facility from its custodian, and the rest was left unpaid: at first under a seven-day delay on redemption payments, and then under an SEC-approved suspension of all redemption rights. The fund later announced that any assets that it cannot sell at or above cost would be held until maturity (3-12 months). Faced with a choice between capital preservation and liquidity, the Board of the Primary Fund went with capital preservation.

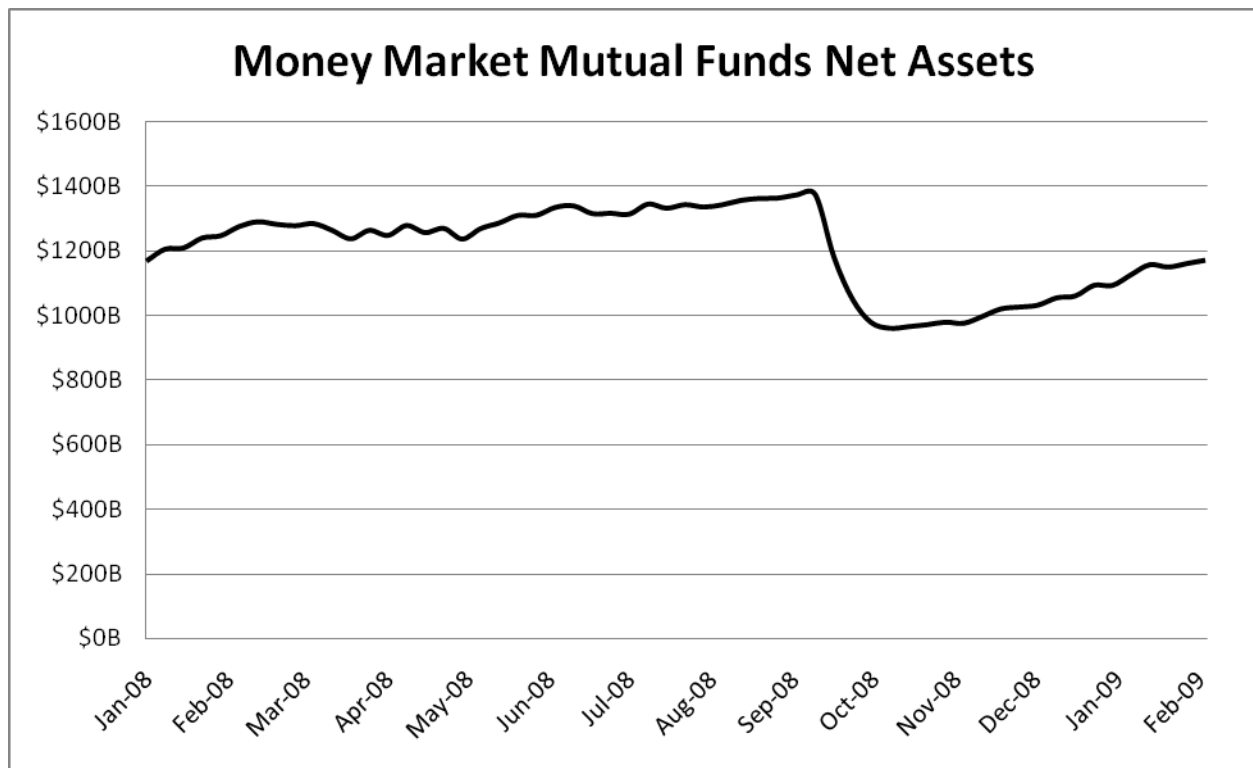
The problems with the Primary Fund scared investors in other money market funds, even those without any exposure to Lehman Brothers. The \$10B Reserve Government Fund, which invested in agency securities, never broke the buck, but faced \$6B in redemption requests for the week. Due to illiquidity of the agency markets, The Reserve followed precisely the same approach with this fund (it was later liquidated at \$1).

On September 17, in a then unprecedented move, Putnam Investments announced the liquidation of its \$12B money market fund after significant redemption pressure. Liquidation was another technique to avoid selling assets when the market could not provide liquidity. The fund maintained \$1 NAV and was acquired the following week by Federated Investors at \$1 per share.

In total, investors in institutional non-government money market funds redeemed a record \$193B (or about 14% of the total assets) during the week; \$82B of that money flowed into funds that invested in treasury bonds.

The runs on the money market funds contained elements of both Diamond-Dybvig and fundamentals bank runs, as investors feared both the loss of liquidity due to redemptions and the loss of NAV due to poor asset credit quality. Such runs threatened irreparable damage to the

sectors of the economy that relied on short-term capital market, as money flowed out of the money market funds that invested in any kind of commercial paper. As a result, on September 19, 2008, The Treasury Department announced a temporary guarantee program to protect shareholders of money market mutual funds from loss of principal. The program, offered at an annualized cost of 0.04% to 0.06% of the fund's total NAV, is currently scheduled to last until at least April 30, 2009. The insurance was only offered to funds that consistently maintained NAV at \$1, and only covered positions as of September 19, 2008 (not new purchases). The intention was to prevent the run on mutual funds by existing shareholders, rather than use the government backing to attract new flows. All major fund families joined the program between September 29 and October 8. The following week, the negative asset growth in the most fragile sector, the institutional nongovernment money market funds, was reversed. Nevertheless, as of February 25, 2009, the total assets in this sector barely approached the September 17, 2008 level, and remained far below the pre-Lehman bankruptcy level (see Figure 7; source: Investment Company Institute).



**Figure 7**

On September 25, 2008, Washington Mutual Bank was closed by the Office of Thrift Supervision in the largest bank failure in US history. In a way, it was another victim of Lehman’s collapse: the OTS announced that its action came as a result of a run on WaMu that began on the day of Lehman’s bankruptcy, and drained it of \$16.7B in deposits over the ten-day period. As with IndyMac, most WaMu depositors were fully FDIC-insured, and they ran because they were poorly informed about deposit protection and scared by Lehman’s collapse. This “run of misunderstanding” clearly contributed to the bank’s collapse by stripping it of liquidity. Whether WaMu was solvent at the time it was taken over is far from clear. On the one hand, the shareholders and subordinated debt holders were wiped out, which suggests insolvency. On the other hand, the regulators’ incentive was not to protect shareholders but rather to secure the deal

as soon as possible to minimize the potential cost to taxpayers (indeed, no FDIC funds were spent). FDIC might have sold WaMu at fire-sale prices to safeguard taxpayers' money.

## **Conclusion**

Bank runs on the shadow banking system was a significant factor in the spread of subprime losses to the overall financial system. The fundamentals bank runs were far more common than the Diamond-Dybvig runs, and therefore traditional bank run safeguards would have been ineffective.

More importantly, highly leveraged shadow banks with illiquid assets suffered from the loss spiral effect whereby they were forced to deleverage due to higher margin requirements and falling asset prices. This deleveraging increased margin requirements and reduced asset valuations, thus fueling the next round of the loss spiral (Brunnermeier, 2008).

In addition, several other factors contributed to the crisis.

First, informational problems reached unprecedented levels. Investors could not trust security ratings, price discovery was not functioning due to lack of trading, banks' exposure to toxic assets was hidden from everyone (including the banks' management), and so on. As Federal Reserve Governor Mishkin (Mishkin, 2008) pointed out, "financial innovations often have flaws and do not solve information problems as well as markets have hoped they would". When these flaws become evident, financial markets seize up.

Second, numerous agency problems distorted incentives for market participants. For example, loan originators did not have to provide any warranty about loan performance beyond a short initial guarantee, and hence were motivated by fees rather than loan quality.

Third, the reliance on historical data to estimate future risk has been discredited numerous times, but was nevertheless widely practiced at the highest level of decision-making, both by the industry and the regulators. As a result of this poor risk modeling, investment losses and defaults were far larger than expected. This scared many investors away from any risky assets altogether.

Fourth, the lack of a multilateral settlement mechanism in such markets as CDS created gridlocks where trading partners could not cancel out offsetting positions because of concerns about counterparty credit risk (Brunnermeier, 2008).

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